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## ADMINISTRATIVE RESPONSIBILITIES IN THE FUNCTIONING OF RESEARCH 1/

Edwin  
E. West Allen, 1864-1929

We may start out with the proposition I hope you will all agree with, namely, that the final responsibility for the way in which a station discharges its research functions resides with the director. For he it is who brings together or develops a working staff, maintains the standards of the research done, and is accountable for the effective operation of the organization. Success in the administration of research depends on realizing these responsibilities, and then exercising them effectively.

The director is not merely a chief clerk, as some have facetiously declared; and the administrative function is not exhausted with the apportionment of funds and the transmission of correspondence about projects, which occasionally constitutes a large feature of the executive activity. Those who see the responsibilities of the office in that light are either over-modest or unappreciative of what is implied at the present day. The underlying purpose of an experiment station is research, and administration is to assist it to function. As the head of an organized research group, the director has far more to account for than he had even a few short years ago.

In dealing with this subject I shall consider it from three angles, namely, (1) responsibility for the staff as a working body, (2) for the character of the individual projects as accepted, (3) for the research program as a whole, the combined projects and their organization.

### THE STATION STAFF

With proper administration, an experiment station is what its personnel makes it; the glory of its achievement depends on those who work there.

In practice the director rarely selects more than a part of the station staff. He finds a considerable nucleus when he enters upon his office; so it is one of his duties to get acquainted with the individuals, to learn not only their general qualifications but their special lines of interest and strength and the individual traits to be allowed for. He needs to form a judgment which will guide him in his relations with them. Some of the things he would like to know are their attitudes toward research, the qualities of critical and open-minded inquiry, their personal philosophy, the temper of their aspirations, the habit of intellectual growth, and the kind of work they are best fitted to. Judgment regarding those qualities will necessitate closer contact than the routine course of administration.

Most stations comprise men and women of varying grades of ability and experience; rarely are they all seasoned experts. Some are in the formative period, while others are mature although not necessarily fully developed; some are researchers by nature, others by chance; some give their whole soul to their investigation, while with others it is more or less of a secondary activity; some lean strongly to the theoretical, others have little interest beyond the empirical and practical.

1/ Presented before the Experiment Station Subsection of the Association of Land-Grant Colleges and Universities, at the Washington meeting, Nov. 21, 1928.







With such diverse material does the director have to deal, and there may be project leaders in all the different classes. This complicates the supervision and limits the amount of liberty that can be assigned. While all agree that the best research is the product of intensive individual effort, every director recognizes that his station includes a good deal of work which is not of that grade and is in the hands of persons who are not masters. Whether or not this ought to be the case, it is a reality to be reckoned with, and it makes it necessary for the administrative officer to know his workers thoroughly and be guided by that knowledge in his administration.

Of late directors have had unusual opportunity to exercise their standards in the selection of new workers. In the past three years there have been large numbers of appointments, not only in new lines but in the older established ones as well. While there has been general improvement in the grade of qualifications, in some notable cases the requirements have not advanced to the degree that might be expected at this juncture. Reference is not made merely to the newer lines where the supply of qualified workers has been severely taxed, but to the older established fields. How far the situation is due to dual service, with emphasis on the teaching of practical subjects, I shall not attempt to say.

One of the greatest drawbacks to productive research is the advancement of immature or unqualified workers to positions of responsibility. If administrative officers and department heads appreciate the character and essentials of research, they will assign to leadership only those of demonstrated ability, holding others in a subordinate position. A premium ought to be put on special preparation, and growth established as one of the requirements of advancement. The type of persons needed for the station work will not be secured in sufficient quantity until the requirements are set up and maintained; and this is an administrative responsibility toward research.

#### ADJUSTMENTS TO PERSONAL QUALITIES

The best measure of individual workers is found in their work and their attitude toward it. This becomes an expression of their motives and habits of thought, of their reach and the type of activity they are suited to. After a time it distinguishes those who fall into different types and grades.

It does not require extensive technical knowledge in the various subject matter branches for an administrative officer to determine, for example, the nature of a worker's controlling interest and how far this interest arouses an intellectual impulse; to judge whether he is a routine worker busy gathering data indiscriminately, or is exercising what Sir William Bragg refers to as "well informed concentration on essential details"; whether he is a good technician of the craftsman type, or one whose mind constantly "tries to reach out beyond what can be seen and heard"; whether he has the originality to stand alone or must follow others.

Every director who studies his force intimately will be able to distinguish those of the technician type from those of the imaginative research type; and as an administrative officer he can ill afford not to recognize these distinctions, for they are essential in providing for a research program. This will enable him to apply stimulation and encouragement where it is likely to be helpful, and to regulate supervision and latitude of





freedom; it will furnish the basis for adaptation of individuals to their respective types of work, and for the introduction of new material into the working staff to meet particular needs.

### INITIATING PROJECTS

The written project has become the accepted basis for the various research activities and the allotment of support. These usually originate with the investigators after conference with the director, but their final acceptance is an administrative responsibility. Because they are so basic as affecting policy, their approval or rejection is an important administrative function.

Ability to state a problem, to analyze it into its significant features and set up a workable part is a significant attribute of the research worker. Generally speaking, the project outline is one of the clearest evidences of a worker's purpose and the operation of his mind. There are exceptions, of course, in which the work and point of view of the investigator are advancing so fast that narrow, specific limitations would require constant revision. We can all think of such cases in the advanced ranges of original inquiry, and no administrative officer would wish to handicap individuality and initiative by undue formalities. Frequent conference will enable the changing course of attack to be followed.

But for the rank and file, the project statement is a means of judging of merits and readiness to undertake the task. The worker who is indefinite and insists upon too much latitude usually has not studied his subject or thought it through to the point of forming a tentative working plan.

The suggestions for examining new projects, contained in the report of the Committee on Experiment Station Organization and Policy last year<sup>1/</sup>, are so succinct and to the point I can not refrain from referring to them in passing.

Proposals for new projects as they come to us vary widely in the apparent care bestowed upon them. There has been remarkable improvement, which should here be acknowledged to avoid misunderstanding; but there still are a considerable proportion which show inadequacies, and these are not confined to the newer fields of work. Some of these deficiencies I am venturing to call to your attention, not in a spirit of complaint or criticism, but because of the community of interest.

### TYPES OF PROJECT DEFECTS

The most frequent types of defects in projects as they are received in the Office may be classified as follows:

1. Blanket proposals, broad and indefinite, with many objectives or a composite one.
2. Failure to take account of previous work or of the general status of investigation on the subject.

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<sup>1/</sup> Proceedings Association of Land-Grant Colleges and Universities, 1927, p.196.





3. Defective technique or failure to embody provisions and precautions recognized as essential in good experimental procedure.
4. Inadequate procedure to enable attainment of the objectives, even at the start; sometimes failure to incorporate the means to be employed beyond quite superficial generalities.
5. Demonstrations or pure routine, devoid of proposals for experiments to add to or verify knowledge and looking to local demonstrations.
6. Inadequate support, reflecting either misconception of what is involved or inaugurating the work in a half-hearted way.

These may be taken up in detail, with some examples.

#### BLANKET PROJECTS

Some workers see problems in the large. They seek complete information on a subject, and their interest in it as a whole prevents determination of what is comprehended in it or the selection of a feasible working unit. They do not state a problem but indicate a field. This type of project will be recognized, but a few illustrations out of many will help to characterize it.

A project entitled Optimum Soil and Climatic Conditions Suitable to the Normal Growth of Individual Crops, included in its range hydrogen-ion concentration, lime requirements, active phosphorus, aluminum, nitrates, and organic matter of the soil, air and soil temperatures, soil moisture, and the comprehensive category "modifications of cultural situations by soil amendments"; characteristically it was not confined to any particular kind of crops but was open to all. Another project on Beef Cattle Production and Management included methods and costs, value of grade and native cows, those of different breeds and breeding, and opened the way for the whole range of experiments on feeding and management; while another on Sheep Production in the State proposed to compare several types of sheep as to their adaptation, study early lamb production and wool production, test feeds and rations for wintering ewes, and the effects of type and feeding on quality of meat--a proposal covering in a sketchy way almost every phase of the sheep industry.

Projects for working on all the various diseases of a particular crop, like the strawberry, are not unusual; and the national project on Study of the Factors Which Influence the Quality and Palatability of Meat has been submitted in its entirety in numerous cases, with no limitations or specifications to show what in particular was to be worked upon,

Innumerable examples could be cited, but this is sufficient.

#### CAPITALIZING PREVIOUS WORK

It is not unusual for project outlines to announce a dearth of information on a subject, and to proceed on that basis, when as a matter of fact there are experiments innumerable and of great variety which should be taken into account.





A project on dodder, for example, related to control, for which methods are current, but was proposed as a new subject without reference to the large amount of investigation on record. A horticulturist in an eastern State, through his director, insisted on the dearth of work on fertilizers for fruits, and presented a project designed to meet this deficiency which contemplated four small plots, one with a complete fertilizer and the other three combining the elements two by two, with no check plats and no duplications. It bore no relation to the volume of previous work, and in itself was utterly inadequate.

High Protein Feeds in Mash for Poultry proposed a repetition of time-honored comparisons of dried buttermilk, tankage, meat scrap, and cottonseed meal, with no reference to any previous work or mention of special points to be confirmed or enlarged upon. Corn feeding experiments with poultry related to a comparison of white and yellow corn on two lots of birds, without consideration of previous findings, or ability of the basal ration to supply the vitamin needs and thus mask any differences in the corn in that respect.

Manifestly new projects in familiar fields, if undertaken, ought to be entered upon with a full realization of the present status, the particular points that need to be strengthened, and the obligation to do work that will be constructive. The worker who is able to ingraft his work upon that of his predecessors is in position to magnify his own individual project into a correspondingly larger contribution. The stations have been considerably criticized for duplication, going over the same round of experiments in the same way, with little advance. Evidently there ought not to be ground for such a charge, and directors will recognize it as one of the things to be guarded against in new projects.

#### DEFECTIVE TECHNIQUE

One of the products of experimental work has been the recognition of elements of weakness, and strengthening the methods and procedure essential to fairly reliable results. Yet these are ignored in numerous cases, and the essentials to reliability omitted as if they were not known.

One of the primary requirements of a comparative experiment, for example, is that variables be limited and conditions controlled so that the things compared will stand out in sufficient contrast to make an effective test possible. No one informed would attempt at this stage to justify experiments which violate the first principles of simple comparison on the ground that they were designed to be practical. Such work is unpractical, and any results drawn from it are as unreliable as they are unwarranted. The number of proposals which involve crudities and lack of essentials to securing a clear-cut answer is surprising. The director's office is the natural place to apply the check.

In a project to determine the value of rice by-products for poultry, these were compared with wheat bran in rations containing five other feeds in the mash and two more in the scratch; in all cases the various feed combinations were given ad libitum, and in addition the birds received all the milk they would consume. Obviously the plan was not calculated to show the value or superiority of any of the feeds under test. Again, in a project on rice by-products for chicks, wheat bran was to be compared with rice bran, each fed with no less than nine other feeds, and the comparison further





confused by feeding different basal rations.

In a proposed comparison of certain by-products in their effect on the quality of pork, the hogs were self-fed and given free choice, some having corn and some tankage ad libitum, in addition to the feeds to be compared. The hogs, therefore, were to be in charge of the experiment as far as the feeds they might select was concerned, making any direct comparison of the particular by-products as to their value or their effect on the quality of pork quite out of question.

The importance of replication and of sufficient check plats would hardly seem to call for attention, yet experiments are proposed in which different phosphates are compared without replication on fields where the crop yields on the unfertilized plats ranged all the way from 700 to 2,500 pounds per acre; a project was proposed on the response of crops to organic matter to determine the "high, medium, and low needs of crops," with no provision for untreated checks to serve as a base line from which to measure even the relative response; and in tests of nitrogenous fertilizers for cotton nine different forms of nitrogen were to be compared on 1/26 -acre plats with no duplication of the nitrogen treatment and only one unfertilized plat and one without nitrogen.

With the abundant evidence of sources and liability of error, so much is left to chance that expectation of dependable results would be rated close to nil. Furthermore, the importance of opportunity for statistical treatment in interpretation of results has been emphasized by analysis of field and feeding experiments. Evidently it ought not to be left out of the plan at the present time.

These are not isolated cases of failure to incorporate practice and safeguards long recognized as essential, but I will not tire you with further examples. They are so elementary it is not easy to understand how they withstood the scrutiny of the director's office.

#### INADEQUATE PROCEDURE

Perhaps it is less surprising that large and important objectives should be set up with quite inadequate means of attaining them. Naturally this may be expected in the newer fields of inquiry, where the methods have not been so well developed, but it is by no means lacking in projects in the older subjects.

For example, a project on Absorption of Nitrogen from Various Sources by Plants, to determine the form in which it is taken up, provided only that the plants would be grown under sterile conditions and analyzed as to the amount taken up, as if the means of sterile culture were unimportant or the amount taken up would show the form in which it is absorbed.

Another, aimed to determine the much studied question of the Factors Influencing the Quality of Wheat, especially the protein, relied on the analysis of wheat and soil samples from various sources, to be considered in connection with the climatic, cultural, and other conditions. Such procedure, of course, is purely exploratory in a field quite thoroughly explored,





where investigation under controlled conditions has given positive evidence of the influence of nitrogen on protein. The plan is not adequate to determine, much less to measure, the influence, of individual factors. Although it purposed to determine the effect of fertilizers on quality, no controlled experiments with varying kinds and amounts of fertilizers were provided.

A new project on the much studied subject of Protein Requirements of Growing Chicks, designed to determine this requirement and also "the most economical sources of protein," outline no plan for maintaining lots on different planes of protein intake, and provided for only a very limited test of amounts and sources, as there were to be only five lots. Evidently the title and objects far overran the plan.

A project on Economic and Nutritive Values of Forage and Pasture Plants proposed to trace the relationship between the vitamin content and the chlorophyll content of forage and pasture plants, and the effects on the animal and its products. The plan called briefly for "a determination of the effect of chlorophyll on the animal and on the consumer of the animal products," using small laboratory and larger farm animals. The proposal was an ambitious one, for the approach was new and the whole field of forage and pasture plants was involved; but the procedure was silent on all essential details, such, for example, as the means of isolating and measuring the effect of chlorophyll.

#### DEMONSTRATIONS AND OTHERWISE

The demonstration type of project needs no illustration, but is more in evidence than would be expected from the discussion of the respective fields of demonstration and experiment.

There are frequent proposals also which are purely routine, such as the examination of the farm well waters or determination of hydrogen-ion concentration of the soils of the State, without any connection with a problem or a situation. Others lack adequate elements of measurements by which results may be judged, such as poultry housing ventilation, pasture experiments, soil cultivation, etc. In other cases one is impressed with the short range of interest shown by the outline, as in tests of varieties and species for resistance to some trouble without reference to the nature or character of observed differences, which gives the work a mechanical superficiality.

Sometimes purely exploratory work is mistaken for the end instead of the beginning or basis for investigation. This is not confined to the survey type of project, which again frequently terminates with the summary of the reconnaissance, instead of using it as a background on which to project further inquiry. Even though interesting material is supplied for publication, a statement of the case rarely constitutes an answer to the problem.

#### INADEQUATE SUPPORT

Frequently the support assigned to projects does not evidence sufficient consideration for the actual cost, if the work is to be done properly. Assignments as low as \$25 have been proposed, frequently of \$100 or \$200, and very often of less than a thousand dollars, for projects which inevitably would require several times the amounts stated. A project for the Adams fund was recently received relating to a study of the biology of an important economic





insect, with an assignment of \$100, not to be supplemented from other sources.

I realize that increase in funds has been growing at the rate of \$10,000 a year at least, but each year brings more than \$10,000 worth of new projects as an added liability in many cases. Evidently controlled expansion is an important administrative responsibility. Inadequate support has been abundantly demonstrated to be a wasteful and ineffective practice, responsible for mediocre efforts which drag along for years. If a serious start can not be made, with assurance of reasonable support for the present and the future, economy and good judgment suggest that the project wait.

Furthermore, the allotment of funds each year on the basis of merits and needs of projects, as shown by their progress and plans, seems the part of carefully considered administration. Right to a share in the station funds, or to continued allotments for unproductive projects, is not an inalienable one.

#### CLOSER SUPERVISION INDICATED

I would not convey the impression that the conditions referred to above are typical of the new work taken up since the coming of the Furnell fund. On the contrary there is a large volume of research of an advanced, progressive type which will stand comparison with that in any related field. It is the pride of the stations and can not be too highly commended. But the deficiencies mentioned are far too common for this stage, forty years after the Hatch Act; and they signify a condition as to personnel and supervision which you deserve to know about, for we are all part of a great system.

You will notice that the examples cited for your information are all drawn from the older established lines, and not from the newer fields of agricultural economics, home economics, and rural sociology where procedure has not been so fully worked out. These latter often are less familiar to administrative officers and more difficult for them to deal with. But in the older fields it is believed the evidence bears out the contention that new proposals do not always receive the administrative consideration they ought to, and that even at the present time station staffs are not always as carefully selected as the character of the effort merits but include many who need closer supervision.

And after projects have been inaugurated, the advantage of supervision will not cease. Some measure of follow up is needed to keep the administrative officer advised of their general progress and status. This usually will require some systematic means, either through reports, conferences, or otherwise. Often it seems to be quite informal and irregular.

#### THE RESEARCH PROGRAM

The importance of a general program into which the various projects fit needs little discussion at this time. In a going concern like the experiment station such a program is logical, and with allowance for emergencies it may be expected to be an objective affair, well balanced and directed at outstanding needs. At this stage a fragmentary, fortuitous, unmethodical program can not meet expectations.







The development of such a working plan naturally is a selective process, and here again the administrative function finds an important place. Others may suggest but the director decides--is the check on relative importance, conformity to a general plan, and the type of effort needed to meet the situation. This will eliminate scattered and disconnected efforts, with failure to follow through. It will secure for research projects a more definite and better correlation with respect to what has been done and to common ends sought.

The American stations are engaged on nearly 7,000 projects. These relate to almost every conceivable subject in the broad field of agriculture and rural living, representing great variety of conditions. Quite largely they are being prosecuted independently and piecemeal, but the work has common ends and ultimately ought to fit together into a homogeneous whole. If all the various subjects the stations are investigating and have been working on for the last twenty-five years could be informally coordinated with what has been found out and is under way, so as consciously to direct new work at the gaps and the further steps necessary, what a saving of effort and gain in effectiveness there would be! I raise the question whether it is not an implied obligation in a larger measure than is generally evident.

#### THE DIRECTOR'S OPPORTUNITY

The above sketches a large and time-consuming function in relation to research and those engaged in it, centered in the administrative office. Not only is it an important function--it is well nigh indispensable to meeting the mission of the station under prevailing conditions. Because of the frankness of presentation, I wish this paper to be considered not as a criticism but as an appreciation of the director's responsibilities and opportunities; a job not only worth while, but worthy of the highest qualifications and the most studious effort in promoting this most intellectual type of effort.

The director himself may not be able to attend to all the details and contacts necessary, but he can provide for them without decentralization of authority. This is good organization. He will rarely function as a specialist, but rather as an organizer having a broad grasp and sympathies, intimately acquainted with the general principles and essentials which pertain to all research. He will exercise his authority to see that plans are properly made and properly considered; he will leave the details of execution to the specialists, but he will expect to know whether or not the projects are being properly carried out. These things he can do without limiting individual initiative and responsibility, or losing the confidence and support of the staff.



